

Appln No. 10/561,397
Amdt date November 6, 2008
Reply to Office action of August 6, 2008

REMARKS/ARGUMENTS

Claims 8–28 and 31 are pending in the instant application, of which claim 8 is independent. Claims 8, 11–12, and 16 are amended herein and claim 31 is added. The Applicant respectfully requests reconsideration and allowance of claims 8–28 and consideration and allowance of claim 31.

I. 35 U.S.C. § 112, Second Paragraph, Rejection of Claim 8

Independent claim 8 is rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicant regards as the invention. In particular, the Examiner alleges four ambiguities: (1) what happens when the first and second planes are at an angle of 0° with respect to each other, (2) what is the reference line from which the angle of the axis of rotation is measured, (3) how is the third plane created with respect to the rotatable transfer assembly, and (4) whether the first angle has two possible interpretations.

Claim 8 is amended and claim 31 is added to remove these ambiguities. As such, the Applicant feels that the reasons for the § 112, second paragraph, rejection of claim 8 have been overcome and respectfully requests that the rejection be withdrawn.

II. 35 U.S.C. § 103(a) Rejection of Claims 8–28

Claims 8–28 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Wirz et al. (U.S. Patent No. 6,171,049, hereinafter referred to as “Wirz”) in view of Hineno et al. (U.S. Patent No. 4,653,664, hereinafter referred to as “Hineno”).

The Applicant respectfully traverses as follows.

Claim 8

The Examiner contends that the claim 8 limitation

[R]otatable transfer assembly comprising at least two transfer heads for picking up a first chip from the wafer by a first transfer head in a chip pick-up position, while bonding a second chip to the lead frame by another one of the transfer heads in a chip bonding position; rotating the first chip by the first transfer head from the chip pick-up position to the chip bonding position; and bonding the first chip to the lead frame by the first transfer head in the chip bonding position, while picking up a third chip from the wafer by another one of the transfer heads in the chip pick-up position (emphasis added)

is disclosed by Wirz (Fig. 1, items 24–26 and 7–8). Wirz, however, teaches about a transfer assembly

[E]quipped with two operating heads, specifically each with a receiving head and a depositing head. The receiving head has the purpose of transporting the subject from the receiving plane [wafer] to the intermediate station and the depositing head fetches the subject from here and transports it to the dispensing plane [lead frame] (column 2, lines 25–30)

Unlike the claimed embodiment of the present invention, Wirz does not appear to teach a system where pick-up (from the wafer) and bonding (to the lead frame) take place concurrently. By way of example, Wirz appears to use two heads, but during chip pick-up from the receiving plane (wafer) with one of the heads (the receiving head), the other (dispensing) head is picking up a chip from the intermediate station. Similarly, when the dispensing head is placing a chip on the dispensing plane (lead frame), the other (receiving) head is placing a chip on the intermediate station. Thus, there is no “picking up a first chip from the wafer by a first transfer head . . . while bonding a second chip to the lead frame by another one of the transfer heads” as recited in claim 8 of the present invention.

Furthermore, once Wirz places a chip on the lead frame, the two heads then appear to rotate back (empty) to their pick-up positions to pick up their next chips while claim 8 of the present invention teaches to “rotate[] the first chip by the first transfer head from the chip pick-up position [wafer] to the chip bonding position [lead frame]; and bond[] the first chip to the lead frame by the first transfer head . . . while picking up a third chip from the wafer by another one of the transfer heads.” That is, the claimed embodiment of the present invention teaches to rotate

a chip from the wafer to the lead frame for substantially the entire period that the transfer assembly is rotating while Wirz apparently only rotates chips for substantially half the period that the transfer assembly is rotating.

Finally, Wirz appears to use one type of head (receiving heads) to pick up the chips from their source (wafer) and a different type of head (depositing heads) to bond the chips to their destination (lead frame), while the present invention uses the same head for both roles.

For these reasons, Wirz does not disclose this claim 8 limitation of the present invention which is also not discussed in Hineno et al. Further, there is no apparent reason why one skilled in the art would have combined the cited references at the time when the invention was made to arrive at the claimed invention. Therefore, the Applicant respectfully asks that the § 103(a) rejection of claim 8 be withdrawn and that claim 8 be allowed.

Claim 9

The Examiner contends that the claim 9 limitation “the transfer heads are rotatable essentially along one circle in a fourth plane at right angles to the axis of rotation of the transfer assembly” is disclosed by Wirz (Figs. 1 and 7a–8d). Wirz, however, appears to teach and suggest almost entirely the opposite. The cited figures show a total circular movement of the transfer head assembly to be less than 45°, with the entire range of motion from the receiving head to the intermediate transfer unit to the depositing head to be no more than 90°. More specifically, some (less than 45°) of this movement takes place from the receiving plane (wafer) to the intermediate transfer unit, some of the movement takes place in the intermediate transfer unit (when it reorients the chip in preparation for the depositing head), and the remaining (less than 45°) takes place from the intermediate transfer unit to the dispensing plane (lead frame). Wirz even talks about keeping “the transport path as small as possible” (column 3, line 9). As the figures and preferred embodiments in the present application illustrate, claim 9 is referring to transfer heads that rotate in a full circle, not back and forth in as narrow a circular arc as possible (as apparently taught by Wirz). Consequently, Wirz does not appear to teach or suggest this limitation. Furthermore, claim 9 depends from claim 8, so also includes all terms and limitations

of claim 8 in addition to other limitations, which together further distinguish claim 9 over the cited references. Therefore, the Applicant respectfully requests that the § 103(a) rejection of claim 9 be withdrawn and that claim 9 be allowed.

Claim 10

The Examiner contends that the claim 10 limitation “the transfer heads are spaced regularly along said circle” is disclosed by Wirz (Fig. 1). Figure 1, however, shows no such regular spacing, nor does Wirz appear to describe such a regular spacing. As detailed in the present application (page 5, lines 3–11), “regular spacing” refers to placing the transfer heads in an equidistant fashion around the entire circle. Wirz, by contrast, appears to only disclose two heads and suggests keeping them as close as possible, showing no illustration where they are even more than 45° apart. Consequently, Wirz does not appear to teach or suggest this limitation. Furthermore, claim 10 depends from claim 9, so also includes all terms and limitations of claim 9 in addition to other limitations, which together further distinguish claim 10 over the cited references. Therefore, the Applicant respectfully requests that the § 103(a) rejection of claim 10 be withdrawn and that claim 10 be allowed.

Claims 11–13

Claims 11–13 depend from claim 8, so include all terms and limitations of claim 8 in addition to other limitations, which together further distinguish claims 11–13 over the cited references. Therefore, the Applicant respectfully requests that the § 103(a) rejection of claims 11–13 be withdrawn and that claims 11–13 be allowed.

Claim 14

The Examiner contends that the claim 14 limitation “the transfer assembly is rotated in one direction” is disclosed by Wirz (Fig. 8a–8c). While the Examiner notes that the transfer assembly rotates in one direction between the pick-up and bonding portions, the Examiner fails to note that during the other half of the rotation time (i.e., after the bonding and before the next

pick-up) the transfer assembly rotates in the other direction. In fact, Wirz talks about moving the chips “with great speed” (column 1, line 11), yet the transfer assembly is alternately rotating back and forth. A device that is rotating back and forth with great speed does not teach or suggest rotating in one direction. Consequently, Wirz does not appear to teach or suggest this limitation. Furthermore, claim 14 depends from claim 8, so also includes all terms and limitations of claim 8 in addition to other limitations, which together further distinguish claim 14 over the cited references. Therefore, the Applicant respectfully requests that the § 103(a) rejection of claim 14 be withdrawn and that claim 14 be allowed.

Claim 15

The Examiner contends that the claim 15 limitation “each transfer head comprises a collet which, in the chip pick-up position, is movable in a direction essentially at right angles to the first plane, and in the chip bonding position, is movable in a direction essentially at right angles to the second plane” is taught by Wirz in view of Hineno (Fig. 5). The cited portion of Hineno, however, appears to discuss a device (vacuum chuck) that essentially uses gravity to deploy over the working surfaces, versus the present invention (that has no gravity requirement). In addition, Hineno appears constrained to operating on surfaces that essentially face the same direction (namely, up) while the present invention requires the two surfaces to have some nonzero angle of inclination towards each other (that is, face each other). As such, the rotating vacuum chucks from Hineno cannot be combined with the pivoting arm from Wirz to produce a workable device. Consequently, Wirz and Hineno, alone or in combination, do not appear to teach or suggest this limitation. Furthermore, claim 15 depends from claim 8, so also includes all terms and limitations of claim 8 in addition to other limitations, which together further distinguish claim 15 over the cited references. Therefore, the Applicant respectfully requests that the § 103(a) rejection of claim 15 be withdrawn and that claim 15 be allowed.

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Claim 16

The Examiner contends that the claim 16 limitation “the transfer assembly comprises a counterweight for each collet, each collet being coupled to its corresponding counterweight through a mechanical coupling for compensating radial forces exerted on the collet relative to said axis of rotation” is also taught by Wirz in view of Hineno (Fig. 5). Hineno appears to make no disclosure about counterweights. Wirz appears to neither teach nor suggest them either. Therefore, together, Wirz and Hineno do not suggest them. Consequently, Wirz and Hineno, alone or in combination, do not appear to teach or suggest this limitation. Furthermore, claim 16 depends from claim 15, so also includes all terms and limitations of claim 15 in addition to other limitations, which together further distinguish claim 16 over the cited references. Therefore, the Applicant respectfully requests that the § 103(a) rejection of claim 16 be withdrawn and that claim 16 be allowed.

Claim 17

The Examiner contends that the claim 17 limitation “the mechanical coupling is adapted to be driven by a collet drive motor for moving the collet radially relative to said axis of rotation” is also taught by Wirz in view of Hineno (Fig. 5). Hineno appears to make no disclosure about radial motion relative to the axis of rotation. In fact, Hineno’s vacuum chucks appear to move parallel (not radially) to the axis of rotation, as Fig. 5 shows (see also Fig. 1). In addition, Wirz appears to neither teach nor suggest collet drive motors, so together, Wirz and Hineno do not suggest the radial motion limitation. Consequently, Wirz and Hineno, alone or in combination, do not appear to teach or suggest this limitation. Furthermore, claim 17 depends from claim 16, so also includes all terms and limitations of claim 16 in addition to other limitations, which together further distinguish claim 17 over the cited references. Therefore, the Applicant respectfully requests that the § 103(a) rejection of claim 17 be withdrawn and that claim 17 be allowed.

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Claims 18–24

Claims 18–24 depend (ultimately) from claim 16, so include all terms and limitations of claim 16 in addition to other limitations, which together further distinguish claims 18–24 over the cited references. As a result, the Applicant respectfully requests that the § 103(a) rejection of claims 18–24 be withdrawn and that claims 18–24 be allowed.

Claim 25

The Examiner contends that the claim 25 limitation

[T]he rotatable transfer assembly is rotatable around a transfer assembly stator, a narrow circumferential gap being provided between the rotatable transfer assembly and the transfer assembly stator, the transfer assembly stator comprising groove sections facing the gap for at least the chip pick-up position and the chip bonding position, respectively, each groove section extending in the circumferential direction and being in communication with a first gas duct, each transfer head of the rotatable transfer assembly comprising at least one collet having a pick-up opening, the pick-up opening being in communication with the gap through a second gas duct.

is also taught by Wirz in view of Hineno (column 5, line 38). The cited portion of Hineno only appears to make brief reference to the rotational motor for the transfer assembly. Even conceding the Examiner's point that a motor is a well-known device to provide rotational motion, neither Hineno nor Wirz appears to discuss stators, circumferential gaps, groove sections, or gas transport via multiple gas ducts in the manner disclosed by the present application, so the combination of Wirz and Hineno does not suggest them. Consequently, Wirz and Hineno, alone or in combination, appear to not teach or suggest this limitation. Furthermore, claim 25 depends from claim 8, so also includes all terms or limitations of claim 8 in addition to other limitations, which together further distinguish claim 25 over the cited references. Therefore, the Applicant respectfully requests that the § 103(a) rejection of claim 25 be withdrawn and that claim 25 be allowed.

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Claims 26–28

Claims 26–28 depend from claim 25, so include all terms and limitations of claim 25 in addition to other limitations, which together further distinguish claims 26–28 over the cited references. Therefore, the Applicant respectfully requests that the § 103(a) rejection of claims 26–28 be withdrawn and that claims 26–28 be allowed.

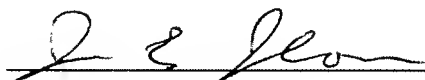
III. New Claim 31

New claim 31 depends from claim 8, with amendments to overcome the § 112 rejection to previous claim 8. Therefore, claim 31 also includes all terms and limitations of claim 8 in addition to other limitations, so the Applicant respectfully requests that claim 31 be allowed.

IV. Concluding Remarks

In view of the foregoing amendments and remarks, the Applicant respectfully submits that claims 8–28 and 31 are in condition for allowance, and a timely Notice of Allowability is earnestly solicited. If there are any remaining issues that can be addressed over the telephone, the Examiner is cordially invited to call the Applicant's attorney at the number listed below.

Respectfully submitted,
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